

Synthesis and Realization of Broadband Magnetic Flux Channel Antennas

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The official link for this solicitation is:

<http://www.acq.osd.mil/osbp/sbir/solicitations/sbir20152/index.shtml>

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Description:

Significant advances have been made recently in the development of magnetic antennas. These antennas are magnetic duals of electric antennas, which allow them to be mounted directly on an aircraft surface. No frequency-dependent backing-cavities are required, which allows true frequency-independent operations. Flux channels in the form of magnetic rings have been shown to replace vertical elements and crossed-linear dipoles. In both cases, no hull penetrations are required save for the feed points, and the external presentation is minimized. However, application to the curved surfaces of aircraft has yet to be addressed. Issues involved are related to the tape-winding process that has been used to manufacture the channels. This process resists conforming to curved surfaces. Designs are required that can be applied to singly and doubly curved surfaces such as those found on aircraft. There is also opportunity here to arrange the geometries to adjust antenna pattern characteristics. The solutions will need to operate over a decade of frequency in the 3 - 600 MHz (MegaHertz) band with frequency-independent characteristics in both impedance and radiation pattern. The antenna should attain a gain greater than 0 dBi and a Voltage Standing Wave Ratio (VSWR) equal to or better than 2.5:1 over at least the upper two octaves of the band. The design should be extendable to other and wider frequency bands for both line-of-sight and satellite communications applications. The primary objective of this solicitation is to extend the capabilities of magnetic-current radiators by constructing frequency-independent geometries. A secondary objective is to consider electrically small antennas and high-power antennas. Using the science and

current development state are described by Sebastian in the references [1, 2]. PHASE I: Determine technical feasibility and develop an approach for frequency-independent geometries for magnetic flux-channel antennas that are conformal to aircraft surfaces and designed to meet the performance requirements in the description section. Prove feasibility through analysis and simulation. PHASE II: Further develop design from Phase I through additional analysis and simulation. Design, manufacture, integrate, and demonstrate the operation of a prototype on a simulated aircraft body to establish practical performance parameters. Based on these results, propose any refinements to the antenna design and fabrication approach and determine the trade-off between cost, weight, and gain-bandwidth performance. Address fabrication cost and volume challenges that are relevant to the general application to aircraft. PHASE III: Finalize the design from Phase II, perform relevant testing and transition the technology to appropriate Navy and commercial platforms. The small business will support the Navy with certifying and qualifying the antenna for Naval use. As appropriate, the small business will focus on scaling up manufacturing capabilities and commercialization plans.